



AT/2652

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

First Named

Inventor : Kevin Schultz et al.
Appln. No.: 09/457,816
Filed : December 9, 1999
For : FLEXIBLE CIRCUIT
Docket No.: S01.12-0517

Appeal No.

Group Art Unit: 2652

Examiner: B. Miller

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MAR 25 2002

TRANSMITTAL OF APPEAL BRIEF
(PATENT APPLICATION - 37 C.F.R. § 192) Technology Center 2600

Commissioner for Patents
Washington, D.C. 20231

I HEREBY CERTIFY THAT THIS PAPER IS
BEING SENT BY U.S. MAIL, FIRST CLASS,
TO THE ASSISTANT COMMISSIONER FOR
PATENTS, WASHINGTON, D.C. 20231, THIS

6th DAY OF March, 2002

Christopher L. Holt
PATENT ATTORNEY

Sir:

Transmitted herewith in triplicate is the Appeal Brief in this application with respect to the Notice of Appeal filed on January 24, 2002.

FEE FOR FILING APPEAL BRIEF

Pursuant to 37 C.F.R. 1.17(c) the fee for filing the Appeal Brief is \$320.00.

The Commissioner is authorized to charge any additional fees associated with this paper or credit any overpayment to Deposit Account No. 23-1123. A duplicate copy of this communication is enclosed.

Respectfully submitted,

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BRIEF FOR APPELLANT

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WASHINGTON, D.C. 20231, THIS

6th DAY OF March, 2002.
Christopher L. Hobbs
PATENT ATTORNEY

Sir:

This is an appeal from an Office Action dated December 3, 2001 in which pending claims were finally rejected.

REAL PARTY IN INTEREST

Seagate Technology LLC, a corporation organized under the laws of the state of Delaware, and having offices at 920 Disc Drive, Scotts Valley, California 95066, has acquired the entire right, title and interest in and to the invention, the application, and any and all patents to be obtained therefor, as set forth in the Assignment filed with the patent application and recorded on Reel 010687, Frame 0301.

RELATED APPEALS AND INTERFERENCES

There are no known related appeals or interferences that will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

STATUS OF THE CLAIMS

Claims 1-20 were originally submitted. Claims 13, 14 and 16-20 were previously cancelled. All pending claims, namely claims 1-12 and 15, stand rejected. Claims 2-12 were finally rejected in the Office Action dated December 3, 2001. As will be explained below, Appellant believes that claim 1 was inadvertently omitted from that final rejection. The rejection of claims 1-12 and 15 is hereby appealed. A copy of claims 1-12 and 15 is attached hereto as Appendix A.

STATUS OF AMENDMENTS

No amendments were filed subsequent to the final rejection.

SUMMARY OF INVENTION

I. INTRODUCTION

The present invention generally pertains to disc storage devices. More specifically, the present invention pertains to disc drive units that incorporate flexible circuits.

II. BRIEF BACKGROUND

Disc drives are used for storing information, typically as magnetically encoded data, and more recently as optically encoded data, on a disc surface. A typical disc drive is shown in the drawing submitted herewith as Appendix B. A disc drive generally includes a load beam that supports a hydrodynamic air bearing (or slider) proximate a rotating magnetic disc. The load beam supplies a downward force that counteracts a hydrodynamic lifting force developed by the air bearing. The slider carries a magnetic transducer for communicating with individual positions on the rotating magnetic disc.

During disc drive operation, an electrical connection must be maintained between the transducer, which is carried by an

actively moving slider, and at least one signal processing component that is, generally speaking, remotely fixed in a stationary position. A flexible circuit or flex cable can be employed to provide a bendable electrical connection between active and stationary components.

Within the particularly sensitive environment of a disc drive, flexible circuit connections preferably do not significantly affect disc drive performance characteristics. As storage densities on disc recording media become higher, the performance characteristics of most all disc drive components, including the slider assembly, become more strict and tolerances are reduced. Therefore, as storage densities increase, it becomes even more important to reduce or eliminate any adverse effects that flexible circuit connections might have on disc drive performance.

III. THE PRESENT INVENTION

The present invention provides a disc drive that incorporates a specialized flexible circuit for electrically connecting the transducer head to a signal processing component. The specialized flexible circuit generally comprises an electrically conductive element and a dielectric liquid crystal substrate laminated to that conductive element. Appellant has discovered that replacing traditional disc drive flexible circuits with this specialized flexible circuit reduces negative influences that a flex circuit might have on the flight characteristics of a transducer head during disc drive operation.

Appellant has discovered that incorporating a dielectric liquid crystal substrate design into the flexible circuits of disc drives enables reductions in undesirable radial forces, circumferential forces and/or yaw torque experienced by disc drive transducer heads during disc drive operation. Further, Appellant has discovered that these specialized flexible circuits enable improved rise times and signal propagation at high data

transfer rates within a disc drive system, as well as reductions in electrical dissipation, as compared to prior disc drive designs. Appellant has also discovered that the specialized flexible circuits enable a cleaner internal disc drive environment with fewer contamination particles to potentially compromise disc drive performance. Appellant has still further discovered that the specialized flexible circuits are also advantageous to application within a disc drive system because they are relatively inexpensive, enabling reductions in disc drive manufacturing costs. Finally, Appellant has discovered that thermoplastic characteristics associated with the specialized flexible circuits enable disc drive assembly to be simplified because such circuits can simply be heat welded to a slider suspension assembly within a disc drive.

ISSUES

Whether claim 1 is anticipated by Boutaghout (U.S. Patent No. 5,796,556) under 35 U.S.C. §102(e); and whether claims 2-12 and 15 meet the requirements of non-obviousness under 35 U.S.C. §103, and thus, are patentable over Boutaghout ('556) in view of Lambert (U.S. Patent No. 5,795,162).

GROUPING OF CLAIMS

The following groupings of claims are made solely in the interest of consolidating issues and expediting this Appeal. No grouping of claims is intended to be, nor should be interpreted as being, any form of admission or a statement as to the scope or obviousness of any limitation.

GROUP 1: Claim 1

GROUP 2: Claims 2-12 and 15

ARGUMENT

I. INTRODUCTION

A. Prosecution of the Present Application

Appellant filed patent application Serial No. 09/457,816 on December 9, 1999, claiming priority to Provisional Application Serial No. 60/116,781 filed on January 22, 1999.

In the Office Action of June 29, 2001, claim 1 was rejected under 35 U.S.C. §102(b) in view of Boutaghout (U.S. Patent No. 5,796,556) and, alternatively, in view of Himes et al. (U.S. Patent No. 6,046,886). In Appellant's response dated August 27, 2001, Appellant claimed priority from the Himes '886 reference, thereby rendering moot the §102 rejection based on that reference.

Also in Appellant's response filed August 27, 2001, Appellant made argument as to why claim 1 should be patentable over the Boutaghout '556 reference. The Office Action of December 3, 2001, however, completely omits claim 1 from consideration and comment.

This is unusual because claim 1 was not (and has not since been) cancelled or withdrawn. Accordingly, Appellant assumes that the omission of claim 1 from the final rejection was an oversight on the part of the Examiner. Therefore, Appellant will assume that claim 1 is finally rejected for the reasons set forth in the earlier Office Action of June 29, 2001.

In the latest Office Action of December 3, 2001, claims 2-12 and 15 (on appeal) were finally rejected under 35 U.S.C. §103(a) as being unpatentable over Boutaghout ('556) in view of Lambert (U.S. Patent No. 5,795,162).

B. Prior Art

U.S. Patent No. 5,796,556 (Appendix C) to Boutaghout teaches a combined gimball flexure and electrical interconnect assembly for application within disc drive data storage systems. Column 1, lines 10-15. The assembly includes a load beam or suspension 12 and a flex cable 14. Column 2, lines 15-16. The flex cable 14 includes a plurality of electrical traces 20 and a

carrier 18 made of a material such as polyamide. Column 2, lines 20-22. The teachings of Boutaghou fail to provide any disclosure directed to a disc drive that incorporates a flexible circuit having a dielectric liquid crystal substrate.

U.S. Patent No. 5,795,162 (Appendix D) to Lambert teaches a radio frequency flex circuit transmission line and a related interconnection method for wireless communication systems.

Column 1, lines 10-19. The teachings of Lambert include a radio frequency enabled flex circuit 36. Column 3, lines 56-65. Lambert teaches that, in order to optimize radio frequency signal characteristics, flex circuit 36 may incorporate a liquid crystal polymer material, namely a product called Vectran, as the incorporated dielectric material. Column 5, lines 40-56. However, the teachings of Lambert fail to provide any disclosure directed to a disc drive that incorporates a flexible circuit having a dielectric liquid crystal substrate.

II. THE REJECTION OF THE PENDING CLAIMS SHOULD BE REVERSED

A. Claim 1 Is Allowable Over Boutaghou

Claim 1 was rejected under 35 U.S.C. §102(b) as being anticipated by Boutaghou. The Office Action asserts that Boutaghou discloses a suspension assembly for use in a magnetic disc drive apparatus, wherein the disc drive includes a selection means for positioning a transducer and a conducting means for providing electrical connection between the transducer and an external circuit.

Appellant respectfully submits that proper construction of independent claim 1 must be done in accordance with 35 U.S.C. §112, paragraph 6. Section 2181 of the Manual of Patent Examining Procedure, provides guidance with respect to when claim language falls within 35 U.S.C. §112, paragraph six. Specifically, the M.P.E.P. sets out the following three-prong test:

- 1) the claim limitation must use the phrase "means for" or "step for";

- 2) the "means for" or "step for" must be modified by functional language; and
- 3) the phrase "means for" or "step for" must not be modified by structure, material or acts for achieving the specified function.

Independent claim 1 recites "a selection means for positioning a transducer" and "conducting means for providing electrical connection." Appellant respectfully notes that both of these elements are set forth as "means for". Further, in both cases, the functions provided after the preposition "for" require a proscribed functionality (positioning and providing). Therefore, both of the claimed elements recite "means for" as set forth in the first two prongs of the test. Appellant respectfully submits that these two prongs have been satisfied. Appellant respectfully submits that no structure for positioning or providing is set forth in independent claim 1 that would preclude applicability of 35 U.S.C. § 112, paragraph six. Thus, Appellant respectfully submits that the third prong of the test has also been satisfied.

35 U.S.C. § 112, sixth paragraph, states, in part, that a claim containing an element expressed as a means for performing a specified function without recital of structure, "shall be construed to cover the corresponding structure . . . described in the specification and equivalents thereof." The Federal Circuit has held that means-plus-function language in a claim must be construed according to the specification. See In re Donaldson Co., 29 U.S.P.Q.2d 1845 (Fed. Cir. 1994). The PTO may not disregard the structure disclosed in the specification corresponding to means-plus-function language when rendering a patentability determination. Id. at 1850.

In Donaldson, the Federal Circuit held that Section 112, Paragraph 6, applied to proceedings in the Patent Office.

Particularly, the Federal Circuit held that Section 112, Paragraph 6, requires the Patent Office to construe a means plus function claim to cover the corresponding structure described in the specification.

In the present case, independent claim 1 recites a disc drive having a conducting means for providing electrical connection between a transducer and an external circuit. The structure of the conducting means is disclosed in Appellant's specification at least beginning on page 4, line 9, and extending through page 6, line 10, and can be located in other various locations throughout Appellant's specification. Although the rejection of claim 1 asserts that the disc drive suspension assembly of Boutaghou has its own means 20 for providing electrical connection between a transducer and an external circuit, there is no disclosure in the teachings of Boutaghou that suggests the specific structures set forth in Appellant's specification. The teachings of Boutaghou at least fail to provide any disclosure directed to a disc drive that teaches or suggests a flexible circuit having a dielectric liquid crystal substrate, as is specifically taught in Appellant's specification. Therefore, Appellant respectfully requests that the Board reverse the Examiner's rejection of claim 1.

B. Claims 2-12 and 15 Are Allowable Over The References Cited By The Examiner

Claims 2-12 and 15 were rejected under 35 U.S.C. §103(a) as being unpatentable over Boutaghou in view of Lambert.

It is respectfully pointed out that neither Boutaghou nor Lambert provide any disclosure directed to a disc drive that incorporates a flexible circuit having a dielectric liquid crystal substrate, as is claimed in independent claim 2. Presented with the inability of either reference to anticipate the invention of claim 2, the Examiner, particularly in the Final Office Action, alternatively argues that the teachings of the two references can

be combined so as to render obvious the invention of claims 2-12 and 15.

Appellant respectfully points out that the "fact that the claimed invention is within the capabilities of one of ordinary skill in the art is not sufficient by itself to establish *prima facie* obviousness. See §2143.01 of the Manual of Patent Examining Procedure. Even if the references relied upon do, in combination, teach all aspects of the claimed invention, that still is not sufficient to establish a *prima facie* case of obviousness without some objective reason to combine the teachings of the references. Ex parte Levingood, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993).

In the Final Office Action, the Examiner alleges a particular motivation to combine Boutaghou and Lambert. The Examiner essentially states that lacking any unobvious or unexpected results, the proposed combination would have been arrived at through routine engineering optimization and experimentation. It is respectfully submitted that this alleged motivation to combine is too speculative to support a denial of patentability in the present case. The Examiner's alleged motivation to combine is based on assumptions that are opinion-oriented and are not objectively reflected by the record.

It is fundamental that rejections under 35 U.S.C. §103 must be based on evidence comprehended by the language of that section. In re Grasselli, 713 F.2d 731, 739, 218 USPQ 769, 775 (Fed. Cir. 1983). The factual inquiry whether to combine references must be thorough and searching. Id. It must be based on objective evidence of record. In re Sang Su Lee, Case No. 00-1158, *7 (Fed. Cir., January 18, 2002) (Fed. Cir. BBS). In the present case, the only conclusion that can be reached from the alleged combinability of the references is the impermissible hindsight gleaned from the present invention. See, e.g., Ex parte Haymond, 41 USPQ2d 1217, 1220 (BdPatApp&Int 1996) (the Examiner

"may not, because he doubts that the invention is patentable, resort to speculation, unfounded assumptions or hindsight reconstruction to supply deficiencies in the factual basis.")

Simply stated, the present Office Actions do not provide any objective evidence that shows a motivation to combine the Boutaghou and Lambert references. Without such objective evidence, no *prima facie* case of obviousness has been made for claims 2-12 and 15. Therefore, this rejection is improper.

Further, in the Final Office Action itself, another rationale is provided as to why claims 2-12 and 15 are non-obvious and therefor patentable. As was previously noted, the Office Action essentially states that lacking any unobvious or unexpected results, the proposed combination would have been arrived at through routine engineering optimization and experimentation (emphasis added). Appellant respectfully submits that there are unobvious and unexpected results associated with incorporating a dielectric liquid crystal substrate design into the flexible circuits of disc drives. Several of these results are specifically described in Appellant's specification.

Appellant has discovered that adapting disc drives to include flexible circuits having a dielectric liquid crystal substrate leads to reductions in certain negative influences on transducer head motion during disc drive operation. For example, reductions in undesirable radial forces, circumferential forces and/or yaw torque are experienced. Further, Appellant has discovered that these specialized flexible circuits enable improved rise times and signal propagation at high data transfer rates within a disc drive system, as well as reductions in electrical dissipation, as compared to prior disc drive designs. See, e.g., Appellant's specification at page 13, lines 25-30. Appellant has also discovered that the specialized flexible circuits enable a cleaner internal disc drive environment with fewer contamination particles to potentially compromise disc drive

performance. Appellant has still further discovered that the specialized flexible circuits are also advantageous to application within a disc drive system because they are relatively inexpensive, enabling reductions in disc drive manufacturing costs. See, e.g., Appellant's specification at page 4, lines 1-21. Appellant has discovered that thermoplastic characteristics associated with the specialized flexible circuits enable disc drive assembly to be simplified because such circuits can simply be heat welded to a slider suspension assembly within a disc drive. Id. Finally, Appellant has discovered that the specialized circuits have sufficient mobility and improved resonant motion insensitivity so as to enable more precise positioning of disc drive transducer heads.

Simply stated, Appellant has discovered that incorporating a dielectric liquid crystal substrate design into the flexible circuits of disc drives enables a range of significant unobvious and unexpected improvements for disc drives, as compared to prior designs. Neither Boutaghou nor Lambert teach or suggest any of these unobvious and unexpected improvements. Therefore, the necessary motivation is lacking and this rejection is improper.

CONCLUSION

Appellant respectfully submits that independent claims 1 and 2 are neither taught nor suggested by the references cited by the Examiner. Also, Appellant respectfully submits that claims 3-15 and 17 are allowable as well by virtue of their dependency from allowable independent claim 2. Thus, Appellant respectfully requests that the Board reverse the Examiner and find all pending claims allowable.

Respectfully submitted,

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CLH



Appendix A

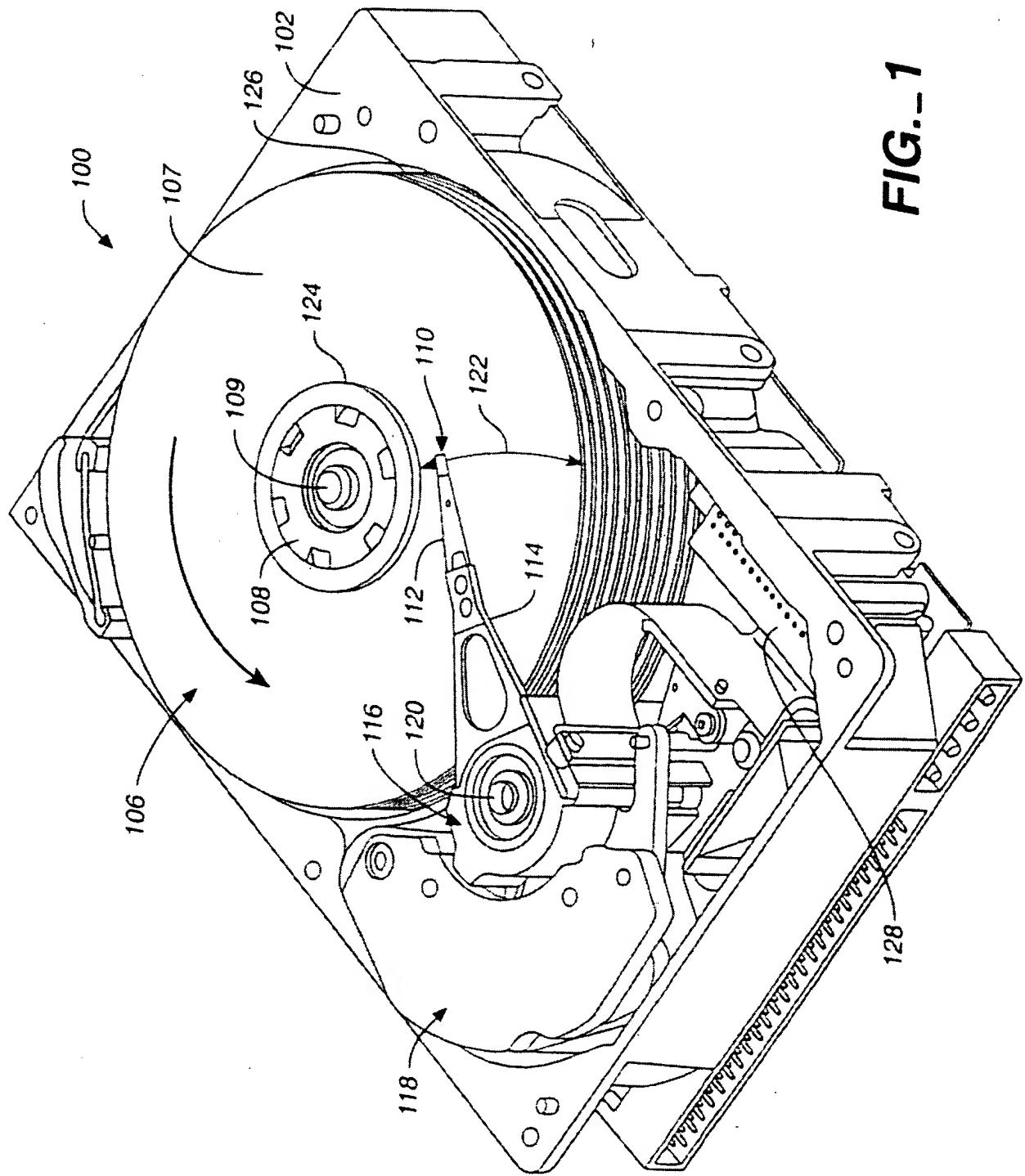
1. A disc drive comprising:
a selection means for positioning a transducer at a select point in space; and
a conducting means for providing electrical connectoин between the transducer and an external circuit.
2. A disc drive comprising:
at least one data storage disc;
a suspension assembly that includes a transducer head supported on an adjustable arm; and
a flexible circuit comprising an electrically conductive element and a dielectric liquid crystal substrate laminated to the conductive element, the flexible circuit being electrically connected to the transducer head and the transducer head being configured to be carried proximate a surface of a spinning data storage disc.
3. The disc drive of claim 2 wherein the conductive element comprises copper.
4. The disc drive of claim 2 wherein the dielectric liquid crystal substrate has a thickness less than about 0.001 inches.
5. The disc drive of claim 2 wherein the dielectric liquid crystal substrate has a thickness from about 0.0001 inches to about 0.0005 inches.
6. The disc drive of claim 2 wherein the dielectric liquid crystal substrate comprises a polyester.

7. The disc drive of claim 2 wherein the dielectric liquid crystal substrate has a dielectric constant from about 2.6 to about 3.0.
8. The disc drive of claim 2 wherein the dielectric liquid crystal substrate has a coefficient of thermal expansion from about 15 ppm/ $^{\circ}$ C to about 19 ppm/ $^{\circ}$ C.
9. The disc drive of claim 2 wherein the dielectric liquid crystal substrate has a coefficient of humidity expansion of less than about 4 ppm/% relative humidity.
10. The disc drive of claim 2 wherein the dielectric liquid crystal substrate has an elastic modulus from about 900 kpsi to about 1300 kpsi.
11. The disc drive of claim 2 further comprising a cover coating forming protective coating over at least a portion of the conductive element.
12. The disc drive of claim 2 wherein the liquid crystal substrate comprises a thermoplastic.
15. The disc drive of claim 2 wherein the data storage disc comprises a magnetic disc.

APPENDIX B



COPY OF PAPERS
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Appendix E

LIST OF CASES CITED

In re Donaldson Co., 29 U.S.P.Q.2d 1845 (Fed. Cir. 1994).

Ex parte Levengood, 28 USPQ2d 1300 (Bd. Pat. App. & Inter. 1993).

In re Grasselli, 713 F.2d 731, 739, 218 USPQ 769, 775 (Fed. Cir. 1983).

In re Sang Su Lee, Case No. 00-1158, *7 (Fed. Cir., January 18, 2002) (Fed. Cir. BBS).

Ex parte Haymond, 41 USPQ2d 1217, 1220 (BdPatApp&Int 1996).